CLAIMS

1. An exposure apparatus which exposes a substrate by radiating an exposure light beam onto the substrate through a liquid, the exposure apparatus comprising:

a projection optical system which projects an image of a pattern onto the substrate; and

a substrate table which holds the substrate, wherein:

a member, at least a part of a surface of which is liquid-repellent, is provided exchangeably on the substrate table.

2. The exposure apparatus according to claim 1, wherein the member is exchanged depending on deterioration of liquid repellence thereof.

3. The exposure apparatus according to claim 1, wherein the member has a flat portion which is substantially flush with a surface of the substrate held by the substrate table.

4. The exposure apparatus according to claim 3, wherein the flat portion is arranged around the substrate.

5. The exposure apparatus according to claim 4, further comprising an attaching/detaching mechanism which

attaches/detaches the member with respect to the substrate table.

6. The exposure apparatus according to claim 5, wherein the attaching/detaching mechanism is capable of detaching the member from the substrate table together with the substrate.

7. The exposure apparatus according to claim 1, wherein at least the liquid-repellent part of the member is formed of polytetrafluoroethylene.

8. A method for producing a device, comprising using the exposure apparatus as defined in claim 1.

9. An exposure method for performing liquid immersion exposure for a substrate by radiating an exposure light beam onto the substrate via a projection optical system and a liquid, the exposure method comprising:

holding the substrate with a substrate-holding member, the substrate-holding member having a flat portion which is disposed around the substrate and which is substantially flush with a surface of the substrate;

loading the substrate-holding member to a substrate stage, the substrate-holding member holding the substrate;

performing the liquid immersion exposure for the

substrate loaded onto the substrate stage; and

unloading the substrate-holding member with which the substrate is held from the substrate stage after completion of the liquid immersion exposure.

10. The exposure method according to claim 9, wherein a surface of the flat portion of the substrate-holding member is liquid-repellent.

11. A method for producing a device, comprising using the exposure method as defined in claim 9.

12. An exposure apparatus which exposes a substrate by radiating an exposure light beam onto the substrate through a liquid, the exposure apparatus comprising:

a projection optical system which projects an image of a pattern onto the substrate; and

a movable stage which is movable relative to the projection optical system, wherein:

a liquid-repellent member, at least a part of which is liquid-repellent, is provided on the movable stage, and the liquid-repellent member is exchangeable.

13. The exposure apparatus according to claim 12, wherein the movable stage has at least one of a measuring stage and a substrate stage which holds the substrate.

14. The exposure apparatus according to claim 12, wherein the movable stage has a plurality of stages.

15. The exposure apparatus according to claim 12, wherein the liquid-repellent member is exchanged depending on deterioration of liquid repellence thereof.

16. The exposure apparatus according to claim 12, wherein the movable stage is a substrate stage which holds the substrate, and the substrate stage includes a holding portion which holds the member, and an attracting unit which detachably attaches the member to the holding section.

17. The exposure apparatus according to claim 16, wherein the liquid-repellent member is a stepped member having a first surface which is opposed to a back surface of the substrate and a second surface which extends to outside of the substrate along a surface of the substrate.

18. The exposure apparatus according to claim 17, wherein at least the second surface is liquid-repellent.

19. The exposure apparatus according to claim 17, further comprising an outer member which has a third

surface extending to outside of the liquid-repellent member along the surface of the substrate and which is engageable with the liquid-repellent member, wherein at least the third surface is liquid-repellent.

20. The exposure apparatus according to claim 17, further comprising a lifting unit which moves the liquid-repellent member upwardly and downwardly with respect to the holding section.

21. The exposure apparatus according to claim 20, wherein the lifting unit moves the liquid-repellent member upwardly from the holding section in a state in which the liquid-repellent member supports the substrate.

22. The exposure apparatus according to claim 16, wherein the liquid-repellent member is a substrate holder having a support portion which supports an edge portion of a back surface of the substrate, a flat surface which extends to outside of the substrate along a surface of the substrate, and a side wall which is connected to the flat surface and which is higher than the flat surface.

23. The exposure apparatus according to claim 22, further comprising a substrate table on which a substrate holder is placed, wherein the substrate holder and the

substrate table have flow passages to make communication with each other respectively.

24. The exposure apparatus according to claim 12, wherein the part of the member, which is liquid-repellent, is composed of fluoride.

25. The exposure apparatus according to claim 12, wherein the liquid-repellent member includes at least a part of a reference member and a part an optical sensor.

26. The exposure apparatus according to claim 25, wherein at least a part of a light irradiated surface of each of the reference member and the optical sensor is liquid-repellent.

27. The exposure apparatus according to claim 12, wherein the part of the liquid-repellent member, which is liquid-repellent, has a light irradiated surface; an adhesive layer is formed on the light irradiated surface; and an amorphous fluororesin layer is formed on a surface of the adhesive layer.

28. The exposure apparatus according to claim 27, wherein the adhesive layer is formed of at least one particulate layer selected from the group consisting of

silicon dioxide, magnesium fluoride, and calcium fluoride.

29. The exposure apparatus according to claim 27, wherein the adhesive layer is a layer which is obtained by etching the light irradiated surface with hydrogen fluoride.

30. The exposure apparatus according to claim 12, wherein the substrate is a circular substrate having no cutout, and a surface and a side portion of the substrate are coated with a photosensitive material.

31. The exposure apparatus according to claim 12, wherein an exchange timing for the member is determined on the basis of decrease in contact angle of the liquid at the liquid-repellent part of the member.

32. The exposure apparatus according to claim 31, wherein the member is exchanged when the contact angle is decreased to be not more than 100°.

33. The exposure apparatus according to claim 31, wherein the member is exchanged when the contact angle is decreased by not less than 10° as compared with an initial state.

34. The exposure apparatus according to claim 12, wherein the movable stage includes a substrate stage which holds the substrate, and the member forms a flat surface around the substrate held by the substrate stage.

35. The exposure apparatus according to claim 34, wherein a surface of the substrate held by the substrate stage is substantially flush with the flat surface disposed therearound.

36. The exposure apparatus according to claim 12, wherein the movable stage has an attracting unit which attracts and holds the member.

37. The exposure apparatus according to claim 12, wherein the liquid-repellent part of the member is formed of a material which is deteriorated by being irradiated with ultraviolet light.

38. An exposure method for performing liquid immersion exposure for a substrate by radiating an exposure light beam onto the substrate through a liquid, the exposure method comprising:

supplying the liquid to at least a part of a surface of the substrate; and

performing the liquid immersion exposure for the

substrate by radiating the exposure light beam onto the substrate through the liquid, wherein:

a part of the exposure apparatus, which is different from the substrate for which the liquid is supplied, is liquid-repellent, and the liquid-repellent part of the exposure apparatus is exchanged depending on deterioration of liquid repellence thereof.

39. The exposure method according to claim 38, wherein the part of the exposure apparatus is a part of a substrate stage or a part of a measuring stage.

40. The exposure method according to claim 39, wherein the part of the substrate stage is exchanged together with the substrate.

41. The exposure method according to claim 38, wherein the deterioration of the liquid repellence is judged depending on a totalized amount of radiation of ultraviolet light.

42. An optical part to be provided on a substrate stage of a projection exposure apparatus which illuminates a mask with an exposure light beam and transfers a pattern of the mask through a liquid onto a substrate held by the substrate stage by using a projection optical system, the

optical part comprising:

a light irradiated surface which is irradiated with the exposure light beam;

an adhesive particulate layer which comprises a particulate layer composed of at least one of silicon dioxide, magnesium fluoride, and calcium fluoride, and formed on the light irradiated surface; and

a water-repellent film which is composed of an amorphous fluororesin and formed on a surface of the adhesive particulate layer.

43. An optical part to be provided on a substrate stage of a projection exposure apparatus which illuminates a mask with an exposure light beam and transfers a pattern of the mask through a liquid onto a substrate held by the substrate stage by using a projection optical system, the optical part comprising:

a light irradiated surface which is irradiated with the exposure light beam;

an adhesive surface which is formed on the light irradiated surface; and

a water-repellent film which is composed of an amorphous fluororesin and formed on the adhesive surface.

44. The optical part according to claim 43, wherein the adhesive surface is an etching surface formed with

hydrogen fluoride.

45. The optical part according to claim 42 or 43, wherein the light irradiated surface has a base material glass.

46. The optical part according to claim 45, wherein the light irradiated surface has a metal film which is formed on at least a part of the base material glass.

47. A projection exposure apparatus comprising a substrate stage, the optical part as defined in claim 42 or 43 and provided on the substrate stage, and a projection optical system which projects a pattern of a mask through a liquid onto a substrate held on the substrate stage.

48. A projection exposure apparatus which illuminates a mask with an exposure light beam and transfers a pattern of the mask through a liquid onto a substrate held by a substrate stage by using a projection optical system, the projection exposure apparatus comprising, on the substrate stage, an optical part including:

a light irradiated surface which is irradiated with the exposure light beam;

an adhesive particulate layer which is formed on the light irradiated surface; and

a water-repellent film which is composed of an amorphous fluororesin and formed on a surface of the adhesive particulate layer.

49. The projection exposure apparatus according to claim 48, wherein the adhesive particulate layer comprises a particulate layer which is composed of at least one of silicon dioxide (SiO_2), magnesium fluoride (MgF_2), and calcium fluoride (CaF_2).

50. The projection exposure apparatus according to claim 48, wherein the light irradiated surface has a base material glass.

51. The projection exposure apparatus according to claim 50, wherein the light irradiated surface has a metal film which is formed on at least a part of the base material glass.

52. An optical part comprising:

a part body which has a light irradiated surface;

a particulate layer which is formed of at least one particulate selected from the group consisting of silicon dioxide, magnesium fluoride, and calcium fluoride, and formed on the light irradiated surface; and

a water-repellent film which is formed of an amorphous

fluororesin, on a surface of the particulate layer.

53. The optical part according to claim 52, wherein the part body is a sensor.

54. An optical part comprising:

a part body which has a light irradiated surface;

an adhesive surface which is formed by etching on the light irradiated surface; and

a water-repellent film which is formed of an amorphous fluororesin, on the adhesive surface.

55. The optical part according to claim 54, wherein the etching is etching using hydrogen fluoride.

56. The optical part according to claim 54, wherein the part body is a sensor.